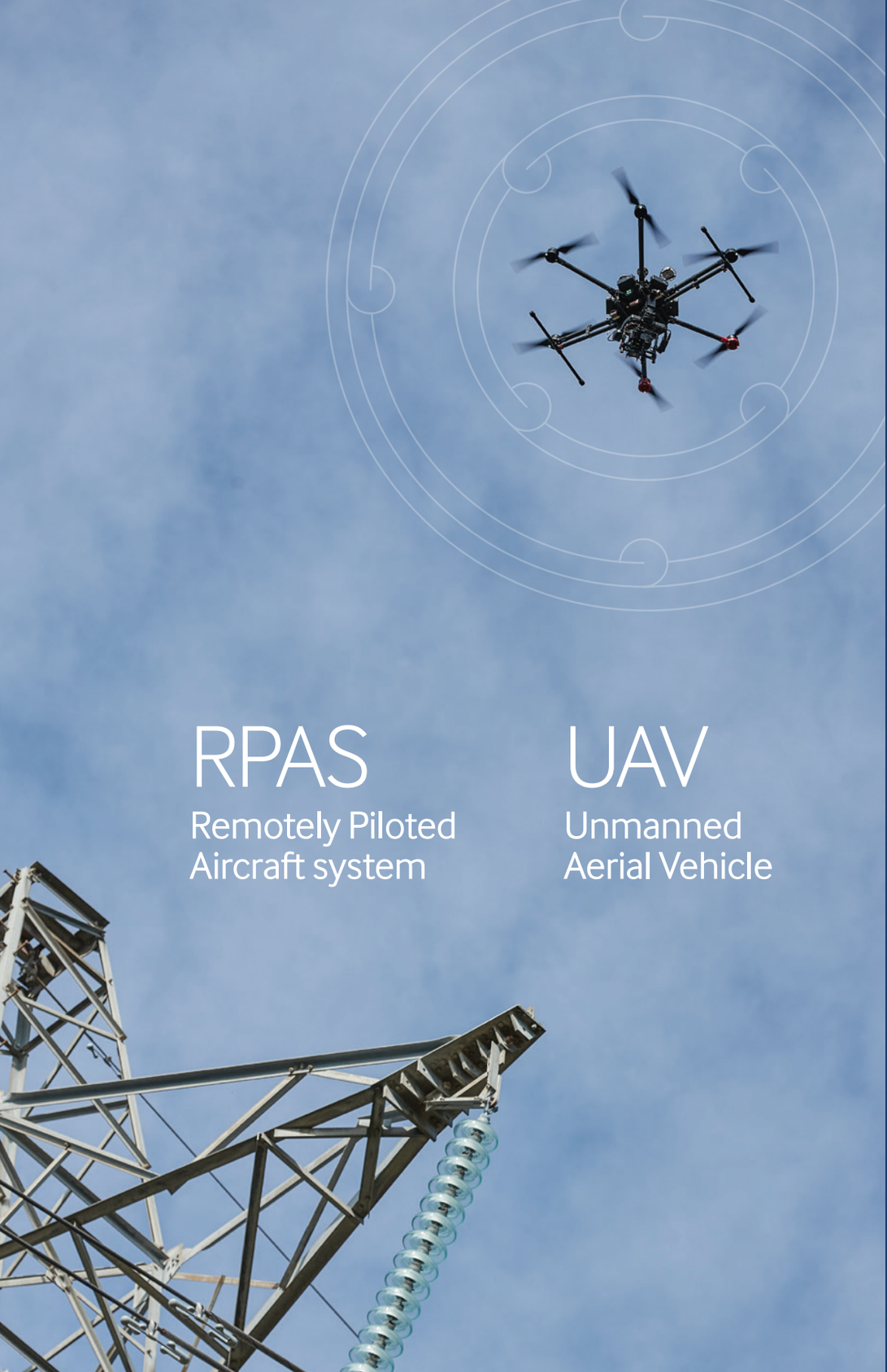
TRANSPOWER

Digital Visual Data Capture

Drones and asset maintenance



RPAS
Remotely Piloted Aircraft system

UAV
Unmanned Aerial Vehicle

What is our Digital Visual Data Capture Project?

The future of our asset maintenance and planning is in data. More specifically, good high-quality images that can be used for analysis.

The Digital Visual Data Capture (DVDC) project is helping us collect data using drones to capture the condition of conductors, towers and poles, substation gantries and substation facilities (building and grounds).

It's with this information that we can have greater clarity on how to prioritise our asset maintenance and optimise how we invest in the National Grid.

A big part of this project is working collaboratively with our service providers. This includes training and trialling in the field, as well as developing photographic standards and service specifications for drones around our assets.

Another focus area is establishing a consistent approach to data collection, assessment, access and storage. This means significant changes to the way we manage our internal storage systems and how we work with our service providers and engineering consultants.

Bringing this into our industry as our BAU by late 2021

Why are we looking at this?

DVDC is a critical enabler to a wider ICON (Intelligent Conductor Management) programme. ICON is the new way in which we manage our conductor maintenance and replacement programme, and DVDC helps us improve our decision making in this work. Benefits of the DVDC work have already been realised. Additionally, the quality of data captured to date has been far above what was previously obtainable. With this in mind, we are looking at significant savings for New Zealand over the next ten years.

As we build our experience and expertise with drones, there'll be other exciting opportunities to improve various workstreams. However, we must first learn to walk before we run.

From a technical perspective DVDC:

- Assists with identifying and prioritising defects
- Helps shape our asset management programming and scoping future projects
- Improves safety for our service providers by reducing climbing hours
- Delivers savings on costs for condition assessment of towers and poles
- Allows us to improve quality assurance condition assessments and consistency across the country
- Improves our relationships with landowners and communities through being less intrusive
- Is more environmentally friendly than using helicopters

The DVDC project can be broken into two parts: Data Capture and Data Storage.

Data capture

- Tower Inspections
- Concrete and Steel pole inspections
- Substation Gantries
- Facilities Management (buildings and grounds)
- Conductor Assessment

The workstreams listed above are our areas of focus while we refine our processes and understand how to use the data to its full potential. This will allow us to embed drones into our business and give our service providers time to become experts. The majority of condition assessment will be done by drones by FY25.

We also continue to discover other benefits, and we trust many more will come to light. This is just the start. Some of these benefits are:

- Vegetation management
- Accessway (including slips) inspections
- Remote line patrol/inspections
- Thermovision inspections (substations)
- Fault response at substations

Data Storage

We are looking at medium to long term solutions for storing data to meet the needs of everyone. Working closely with IST and the Asset Information and Data and Analytics team, we want to make our approach align with Transpower's Information and Communications Technology (ICT) strategy and Data Standards.

Through this work we aim to;

- Adopt new ways of working
- Maintain and modernise services
- Enable a digital Transpower
- Enable data-driven insights
- Drive cybersecurity by design

We first talked to:

- Service Delivery Managers
- Ops Engineering
- Asset Planning — Lines and Subs
- Asset Planning — Other
- Tactical Engineering — Lines
- Tactical Engineering — Subs
- Data and Analytics
- Asset Information
- Tower Paint
- Service Providers
- Engineering Consultants
- IST Other
- Grid Delivery — Projects

Then we consulted about:

- Storage needs
- Data reviewing habits and requirements
- Current and future potential use of data
- Value of storing data
- Frequency of use

Feedback received said that:

- Aerial imagery provides richer data for decision making.
- The shift from 'time-based' to 'condition-based' assessment will improve our maintenance planning.
- The high-quality imagery may negate the need to do some forms of routine inspections and maintenance potentially minimising OPEX costs.
- Working towards our strategic objectives and Asset Health Network Roadmap (AHNR) will enhance the forecasting over the next 15 years for CAPEX.
- Marrying imagery with artificial intelligence is where you see us heading in the future.
- Being able to access the data quickly will lead to faster solutions.
- An increase in safety by reducing climbing hours.
- Environmental benefits by not having to use helicopters.

Timeline

OCT 20

National field trials with service providers commenced

Pilot photography training for service providers began

Established *The Champions Forum*, a collaborative working group across our business and services providers. The forum is the conduit between different levels and divisions of our business to promote consultation and engagement, making sure the project team delivers an excellent product and process for the users.

FEB 21

Consultation and engagement begins across the wider business to establish wants and needs; including research programme (focus groups and questionnaires).

MAR 21

Transpower Assurance and Audit programme finalised.

Monthly meetings with lines and stations Service Delivery Managers start to make sure we are delivering relevant products and processes.

MAY 21

DVDC project expanded to include Substations — field trials begin.

Data storage platform decision — confirmation of the data we store and how we store it.

Change management engagement begins across the wider business

JUN 21

New Service Specification launched.

DVDC input into ten-year Service Provider contract reset.

JUL 21

Service Providers begin first phase of condition assessment delivery with drones.

SEP 21

Data storage — detailed training with key user groups on access and storage requirements.

Image standards and guidelines finalised.

OCT 21

Future artificial intelligence/machine learning project discovery phase begins.

DEC 21

DVDC officially embedded into OUR teams.

Frequently Asked Questions

What is DVDC?

DVDC stands for Digital Visual Data Capture. Using drones equipped with high-resolution cameras Transpower can gather high-quality imagery of our assets to be used for condition assessment.

What will DVDC be used for?

Initially we will be utilising DVDC for towers, poles, conductors and substations (gantries and buildings). However, this technology offers many more exciting opportunities in the future such as fault response, vegetation surveys, slip monitoring and access track assessments.

Who can fly on our network?

To work around Transpower's network you must be an approved Service Provider. Drones must be fitted with suitable high-resolution cameras for DVDC work, and only drones with Real Time Kinematic (RTK) units can fly within 12-metres of our transmission lines or substations.

RTK is a GPS system that helps eliminate the interference from electrical fields and radio waves.

Do drone operators have to be qualified?

Yes. Our drone operators must be trained under the Civil Aviation Authority (CAA) Rules part 101. They also require a pilot's certification and/or Part 102 competency to fly. Given the nature of the job, our drone operators must also be trained in photography.

As a project manager or service delivery manager, what do I need to know about using drones on our network?

Service Delivery Managers and Project Managers will need to understand the Standard Maintenance Procedures and Service Specification relevant to drone use. This includes understanding flight plans, image quality expectations, drone requirements, safety and landowner requirements.

How do drones work on our network?

Conductor assessment

We fly the conductors — taking photos at approximately three metre intervals — between 10-20 metres high (depending on tower configuration). The drones are fitted with cameras that can focus on and capture all three phases on a circuit in one shot. The images are then post-processed (condition assessed, defects identified, photos edited) back in the office and supplied to Transpower.

Transmission line towers and poles

For tower and pole inspections, the drones fly around the structure taking photos from a variety of positions for post-processing.

Substations and Facilities Inspections

Drones are flown above the substation/ buildings at various heights, taking photos of all the gantries and other relevant items for post-processing.

What is post-processing?

Post-processing refers to how we use the imagery to condition assess our assets and identify defects. During post-processing, the service provider adjusts the imagery as necessary, and loads the defect and condition data and imagery into relevant systems such as Mātai or Maximo.

Who will be using the condition assessment information?

We've seen many areas of the business benefiting from the use of imagery. From tower painting, maintenance and project groups, to asset planning, tactical and operational engineers.

What happens to the imagery (digital visual data) once it is captured?

We are currently looking at storage options for the imagery and metadata captured. As a medium-term solution, all defect and non-defect imagery captured via DVDC will go into Transpower's photos and multimedia solution Recollect, due to roll out by the end of 2021.

Who will have access to the imagery?

The proposed storage solution (above) will give key internal and external stakeholders access to the defect and non-defect imagery (Transpower staff, Service Providers, Engineering Consultants).

How long will the imagery be kept for?

Initially, the imagery and metadata will be kept for ten years. This allows us enough time to refine our processes and have a better understanding of our long-term needs. A review group will be established to make these important decisions.

What about the imagery captured and privacy?

Any imagery captured that contains a recognisable individual will be deleted. In the rare instance that the image needs to be kept for the asset information it contains, the privacy breach will be permanently blurred or blacked out.

I've got an idea to use drones for my work at Transpower now!

That's great! There is much potential for the use of drones and digital data capture at Transpower. The DVDC team is concentrating on rolling out the basics with our Service Providers, but we'd love to hear your ideas and the value proposition for the use of drones.

Can anyone fly a drone in NZ?

You don't currently need a license to fly a drone in New Zealand. But you do need to follow the Part 101 drone rules, which are New Zealand Civil Aviation Rules. Refer to the Civil Aviation Authority website for more details: **aviation.govt.nz/drones**. Our drone operators require a pilot's certification and 101 or 102 competency to fly (see previous page).

Who has permission to fly a drone above my property?

If a pilot is certified under CAA 101 they must ask permission of the landowner to fly a drone over their property. If certified under 102, they may only be required to notify the landowner pre- or post-flight and do not require their permission.

Are there places where drones can't be used?

Yes. In controlled airspace or aerodromes without the necessary permissions, or in locations we are unable to get the necessary consent of those we fly above.

Working with the DVDC team

We are working with a range of teams across the business. If you would like to be part of the conversations or know more please contact **dushka.more@transpower.co.nz**